ROMI®

Maintenance Manual

U37614A

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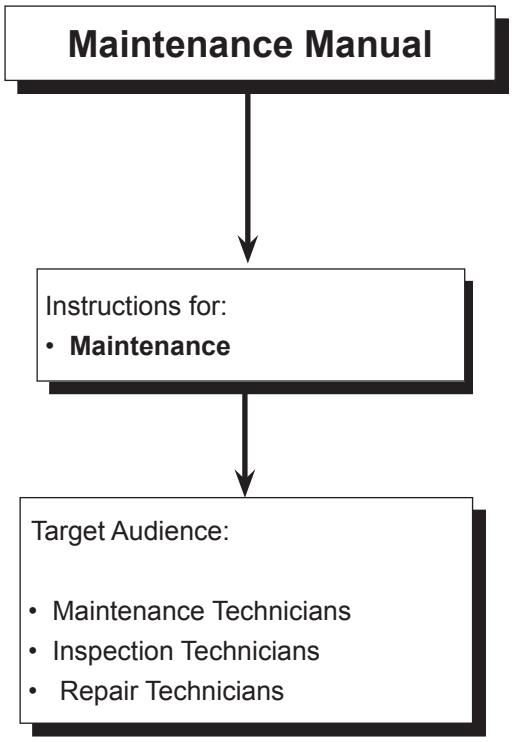
CHAPTER 1

INTRODUCTION

1.1. TARGET AUDIENCE - MAINTENANCE MANUAL



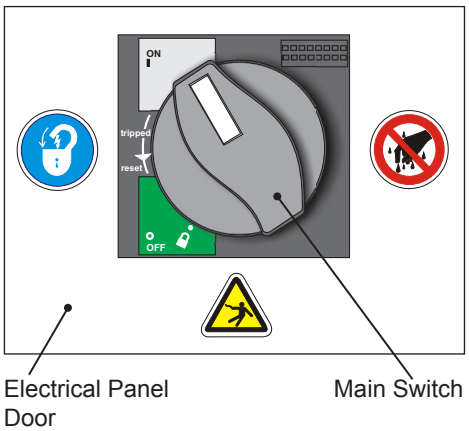
1.2. GENERAL NOTE

IMPORTANT

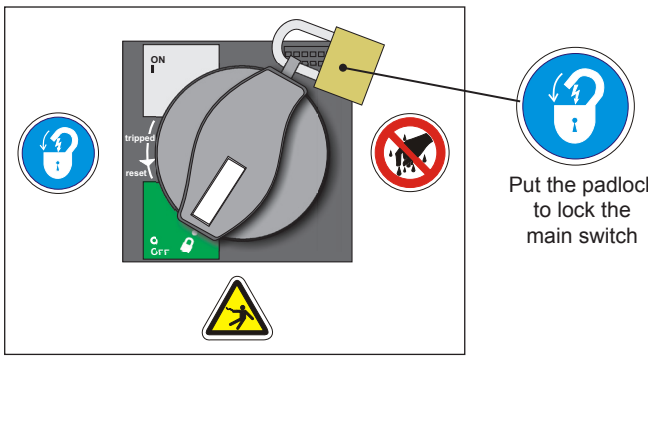
All the maintenance operations MUST BE PERFORMED WITH THE MACHINE TURNED OFF.

Before performing any maintenance work, turn the machine off by using the main switch and lock it with a padlock to prevent serious accidents or material damages.

Machine powered



Machine turned off for maintenance activities



CHAPTER 2

GENERAL MAINTENANCE

2.1. PREVENTIVE MAINTENANCE TABLE

NOTE

This table is intended to guide the machine user about the main components that should be inspected periodically.

ITEMS TO BE INSPECTED BY OPERATOR	Period					
	Daily	Weekly	Monthly	Quarterly	Semester	Yearly
Preheat the machine	■					
Check the lubricating oil level	■					
Clean the filters (basket type) from the coolant tank fluid	■					
Inspect the pneumatic pressures	■					
Inspect the pneumatic system filters	■					
Remove the chip excesses of the machining area and the operator door	■					
Check the compressed air leak	■					
Check for leaks in the lubrication system	■					
Check for leaks in the cooling system	■					
Check the level and quality of coolant fluid		■				
Inspect the lubricator pneumatic system (cleaning and refilling)		■				
Inspect the chip protections		■				
Clean the operation panel externally		■				
Inspect the grip of T.A.F.			■			
Clean the cabinet filters and fans			■			

ITEMS TO BE INSPECTED BY QUALIFIED TECHNICIANS	Daily	Weekly	Monthly	Quarterly	Semester	Yearly
Inspect the lubricating guides and screws			■			
Inspect the linear guides cleaning			■			
Inspect the drives sinks cleaning			■			
Inspect the lubrication system piping and dispensing				■		
Clean completely the coolant tank					■	
Perform the internal cleansing of the electrical panel					■	
Inspect the machine leveling					■	
Inspect the lubrication system piping and dispensing					■	
Replace the lubrication system flow units						■
Replace line filter and suction filter lubrication system						■
Tightening the electrical panel wiring						■

2.2. ABNORMAL NOISE AND HEATING

Pay special attention on unusual noises during operation. They may indicate problems that, when checked immediately, might prevent machine stop.

In a similar way, the abnormal heating of any equipment part may indicate problems that may cause partial or total machine stop.

2.3. CHIP GUARDS

The chip guards are very important elements in terms of machine cleaning and conservation.

These elements must be inspected regularly and replaced in case of wear or eventual breakage.

WARNING:

- Do not allow the accumulation of chips in the machining area and the rails of the door.

It is recommended that the cleaning verification is done daily and with the help of the washing gun.

- Do not use guards as supporting point.
- Do not force the guard surface.

2.4. VISORS

All machine displays should be cleaned according to the procedure below:

ATTENTION:

The utilization of chemical products may damage the polycarbonate surface, causing small cracks and making it opaque.

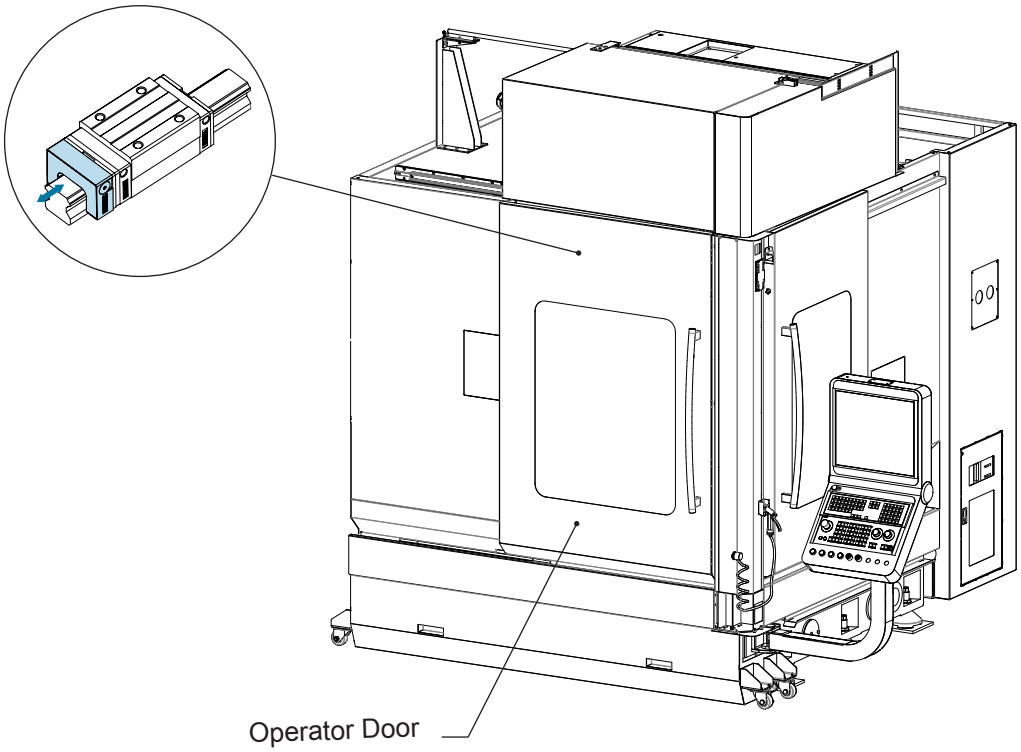
2.4.1. Cleaning procedures (material: polycarbonate)

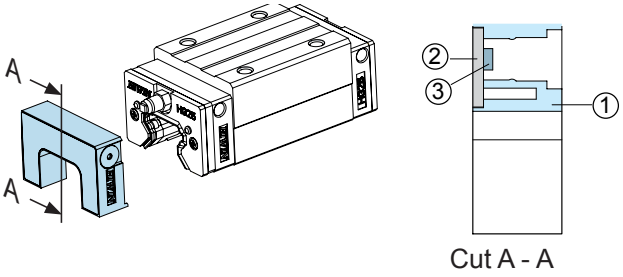
- Rinse with warm water.
- Wash with mild soap and warm water.
- Use soft cloth and sponge to remove the remaining dirt and soot.
- DO NO SCRUB or use brushes or squeegees.
- Repeat rinse and dry with soft cloth to prevent water spots.

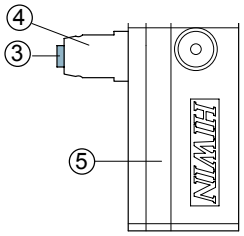
2.5. OPERATOR DOOR

The operator door is supported by ball linear guides with ball self-lubricating bracket that facilitates the movement and allows continuous lubrication without oil waste.

The lubrication the guides occurs through an oil cartridge installed in the bracket and can be easily disassembled, it is recommended that the oil be replaced every six months.



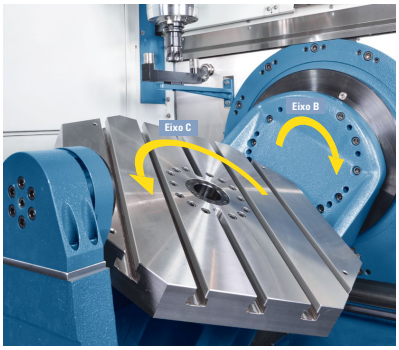




1. Oil cartridge
2. Cartridge cover
3. Oil conductor
4. Connector
5. Lubricator

2.6. ROTARY TABLE LUBRICATION

In the case of using only the linear machine axes (X, Y, Z) must be scheduled at least once every 8 hours a complete rotation of axes B and C for lubrication of bearings, seals and the entire transmission system. Failure to do this procedure may speed up the wear of the mechanical elements of the table and lose accuracy of rotary axes.



2.7. CHECKING ALL THE ELECTRICAL CONNECTIONS

Always turn off the Master Switch before accessing the electrical cabinet.

Never attempt accessing any component inside the cabinet while the machine is powered. There are serious risks of accidents

Make sure that the correct procedures for electric connections were followed before energizing the machine for the first time.

It is highly recommended that all the electric connections be checked and retightened, by using the right tool, during the machine instalation procedure. Always check wiring or loosened connections. Check all the connectors used. It is recommended to check loosen components inside or outside the electrical cabinet.

2.8. ELECTRICAL PANEL - VENTILATION AREA

Always turn off Master Switch before accessing this area, while following the safety procedures for electrical installation and services.

It is mandatory to clean/replace the ventilation filter periodically. The time interval for cleaning the filter must be evaluated according to the work environment where the machine is installed, and the customer must estimate the time required for cleaning the filter.

Never let the panel turned on without the air intake filter.

Check that all the parts related to the electrical panel assembly are properly fitted and sealed. The inner side of the electrical panel must be a clean place; therefore, when dirt is found during the periodical checks, it must be removed.

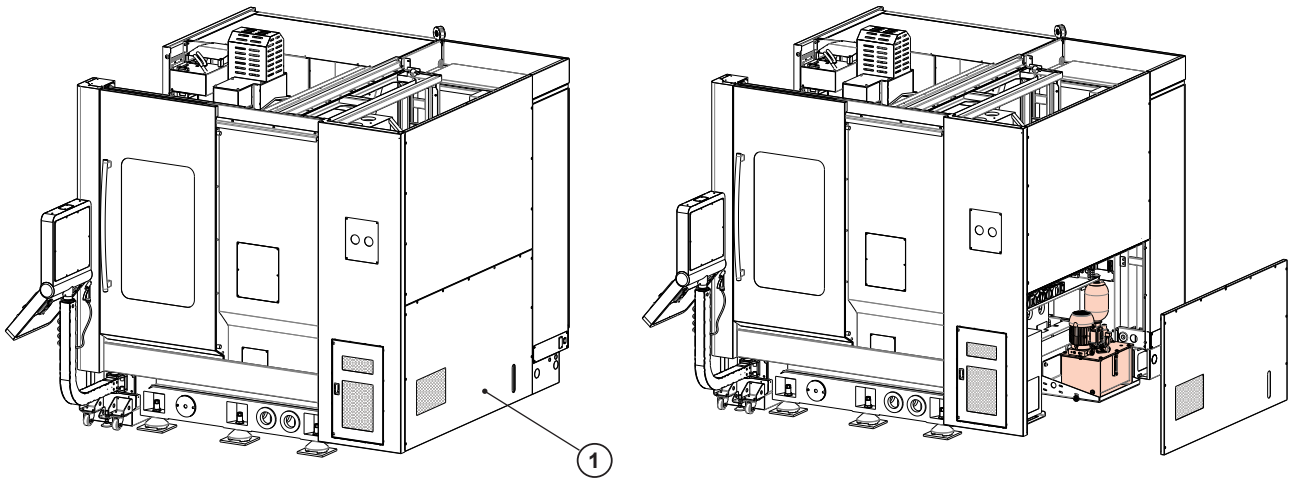
CHAPTER 3

SYSTEM MAINTENANCE

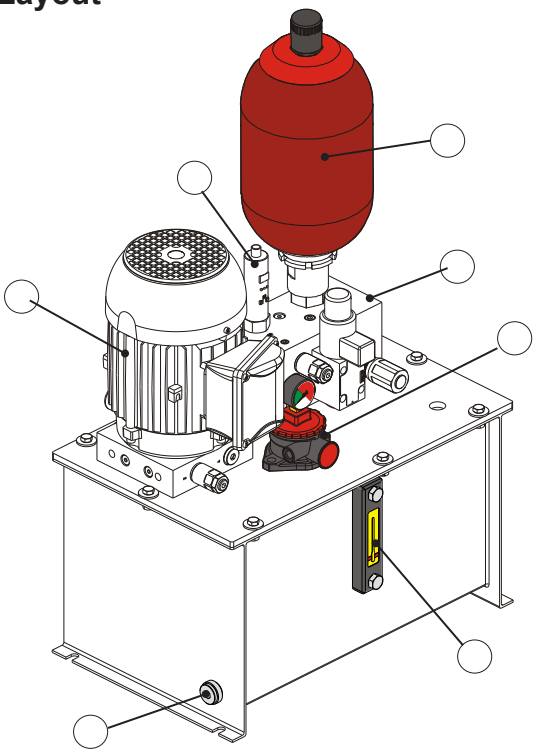
3.1. HYDRAULIC SYSTEM

The hydraulic system is composed of a hydraulic unit, responsible for triggering the tool extraction system and the locking of the table (Axis B and C).

To access the hydraulic unit the protection (1) must be removed.



3.1.1. Hydraulic Unit Layout

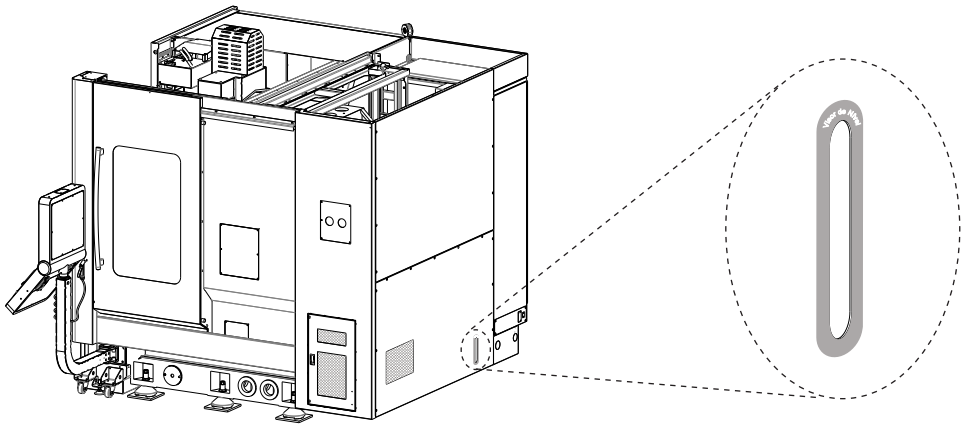


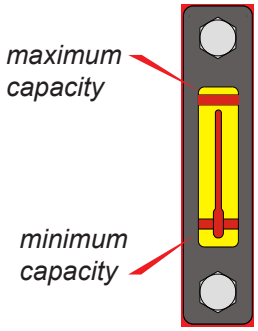
1. Electric motor
2. Digital pressure switch
3. Pressure accumulator
4. Supply filter
5. Pressure accumulator valve block
6. Level display
7. Plug

3.1.2. Periodical maintenance

Oil level:

- Check the lubricant oil level daily, through the access identified in the following figure:



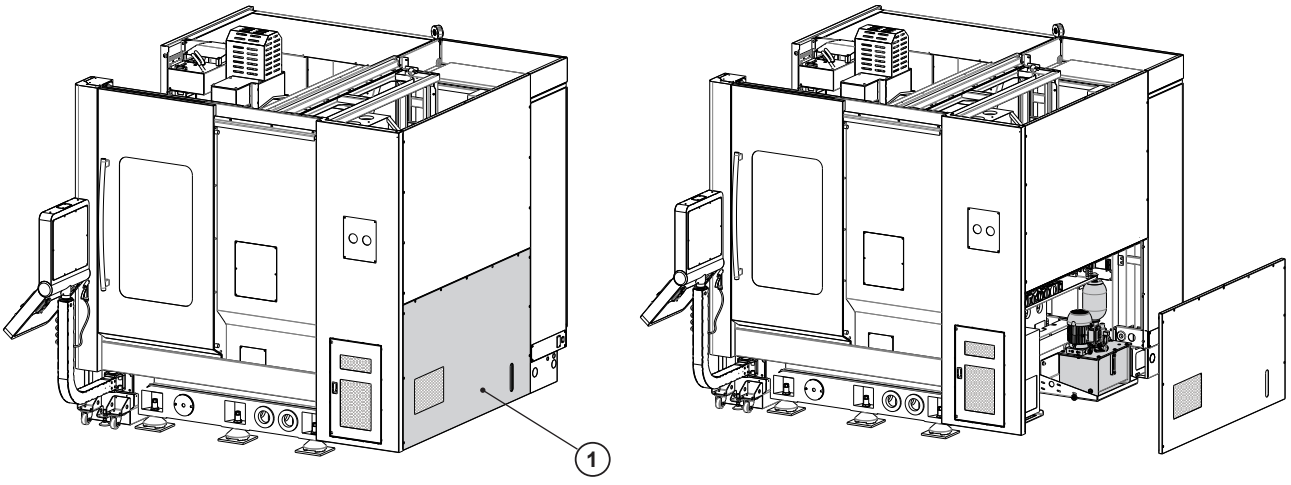


- The top red mark of the oil level display indicates the maximum capacity of this hydraulic unit.
- The red mark under the oil level display indicates the minimum level.

Obs.: Never operate the pump with the oil level below the red mark.

If necessary the provision or replacement of the hydraulic oil, the Sheet (1) for the access to the hydraulic unit should be removed, as illustrated in the following figure.

Sheet approximate weight (1) : 37 kg



3.1.3. Hydraulic Unit Maintenance Procedure

The hydraulic system of ROMI DCM 620 has two hydraulic bladder accumulators, one of which is located on the hydraulic unit and the other is on the hydraulic block of the draw bar.

Whenever the accumulator is disconnected from the hydraulic system for maintenance, transportation, replacement of components among others, the technician service should pay attention to necessary care described in the procedure below:

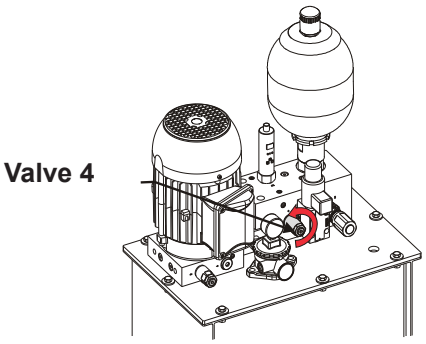
CAUTION

Any and all maintenance for exchanging components must be done with the machine switched off and without pressure in the system.

Hydraulic accumulator unit

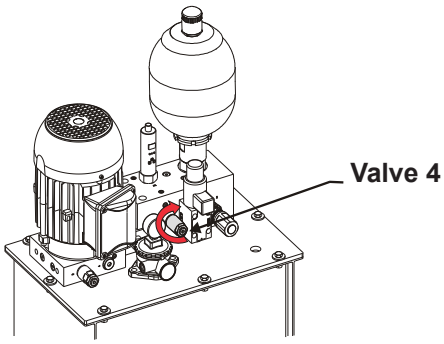
Working condition

1. Close the valve 4
2. Turn the machine on
3. Monitoring the line pressure through the pressure switch



Maintenance condition

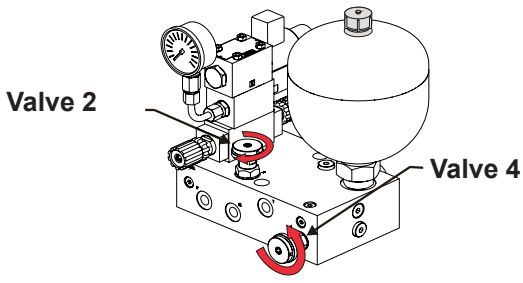
1. Open the valve 4
2. Monitoring the depressurization of the line through pressure switch
3. Turn the machine off



Hydraulic draw bar Block accumulator

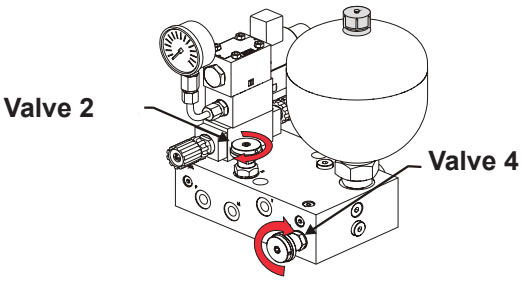
Working condition

1. Close the valve 4
2. Open the valve 2
3. Turn the machine on
4. Monitoring the line pressure through the pressure gauge



Maintenance condition

1. Open the valve 4
2. Open the valve 2
3. Monitoring the depressurization of the line through pressure gauge
4. Turn the machine off



Oil supply (when necessary):

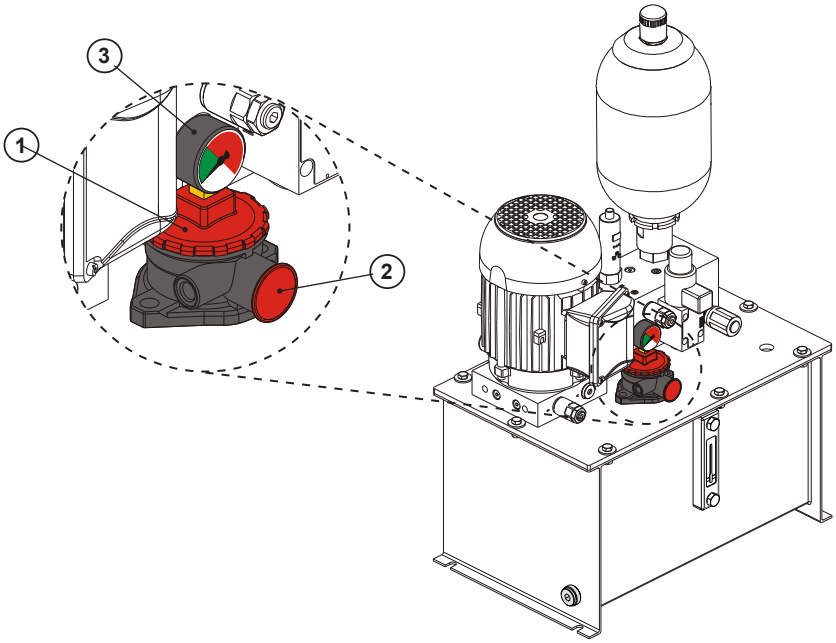
- Remove the cover (1) of the air filter. Supply with DIN 51502 HLP 46 oil and cover again. Check the supply through the level display.

Air filter (when the gauge pointer is in red):

- Remove the cover (2), replace the filter element for a new one, and cover again.

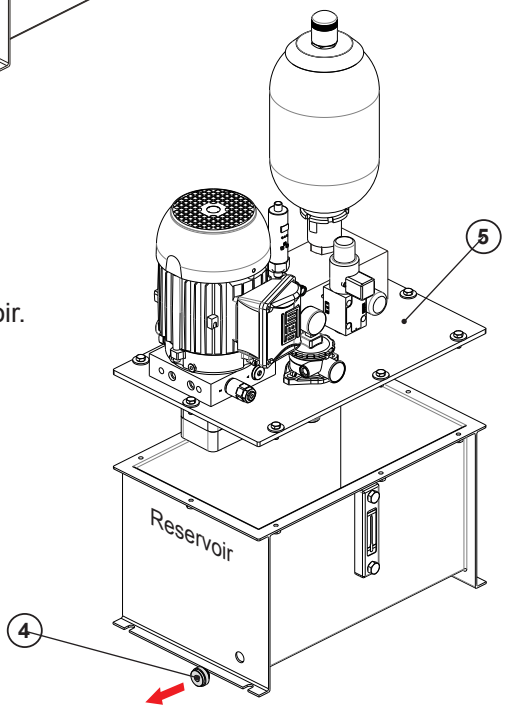
Note: The gauge (3) of the filter indicates when the filter element replacement is necessary.

- Pointer from 0 to 2 bar (green area): is not necessary exchange.
- Pointer from 2 to 6 bar (red area): is necessary exchange.



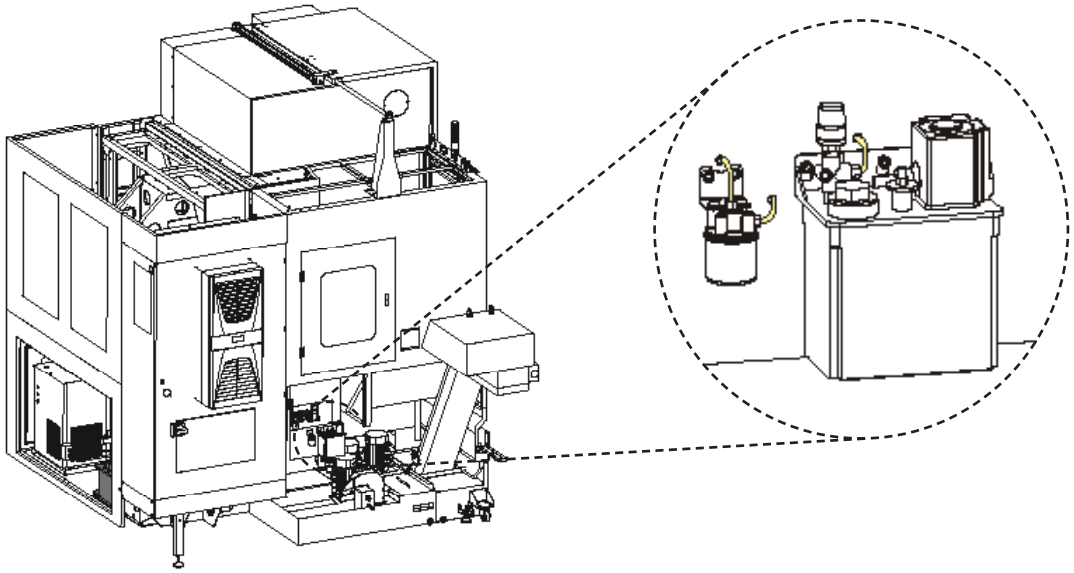
Cleaning the reservoir (every 6 months):

- Remove the plug (4). Once empty, assembly it again.
- Remove the bolts and the access cover (5) to the reservoir.
- Clean the reservoir.
- Install the access cover to the reservoir.



3.2. AUTOMATIC LUBRICATION SYSTEM

All the linear guides and ball spindles are lubricated by the Automatic Lubrication System..



The system contains an intermittent automatic pump driven by an electric motor with regulated oil injection cycles. The flow distributor sends oil to the friction points. Not all lubricants oil are compatible with all liquid coolant. The lubricating oil shall, with the coolant good behavior of demulsification. Lubricant suppliers can inform the lubricating oil compatibility with the coolant.

Oil Discharge Volume and Cycle Time

The lubricator MMXL-III is an automatic intermittent piston pump that sends:

- 1,5cc per course at each 6 min (frequency 50Hz);
- 1,5cc per course at each 5 min (frequency 60Hz).

Discharge Pressure

43 PSI (3 Kgf/cm^2). The peak pressure of the system will decrease when:

1 - The discharge volume decrease.

2 - The number of feeders increase.

3 - The oil viscosity increase.

Oil Viscosity Range

150 a 8000 SSU at operating temperature.

Oil to be used: ISO VG 68 (code DIN CGLP) special for guides.

Reservoir Capacity

0.5 gal (1,8 liter)

Lubrication Filter

It must be periodically inspected and cleaned or changed, as required.

Motor

Synchronous 220V motor (50/60 Hz), 3 watts.

3.2.1. Periodic Maintenance

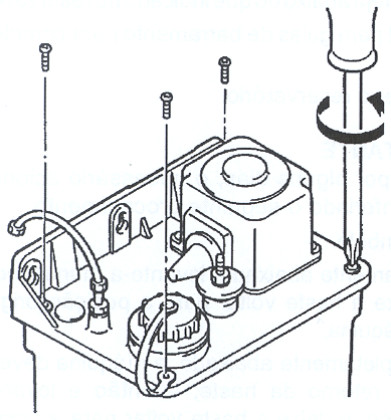
IMPORTANT!

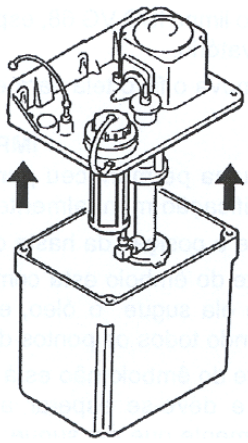
If lubrication is not suitable, the causes may be:

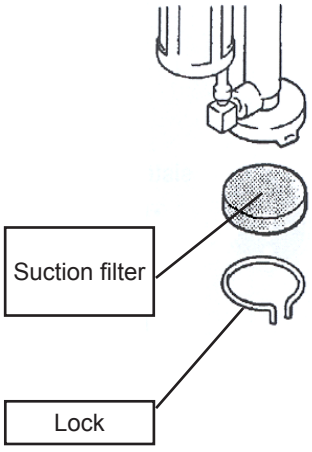
- Low oil level
- Contaminated oil
- Clogged tubes
- Broken tubes (open line)
- Dirty suction filter
- Damage tubing at the pump
- Improper oil viscosity
- Air in tubing system
- Pressure gage

- **Suction Filter**

- It is recommended to replace the suction filter at every 12 months of operation.
- It is necessary to dismount the pump, by separating it from the reservoir, to access the filter.
- Filter codes: Romi R38059 / LUBE 489010





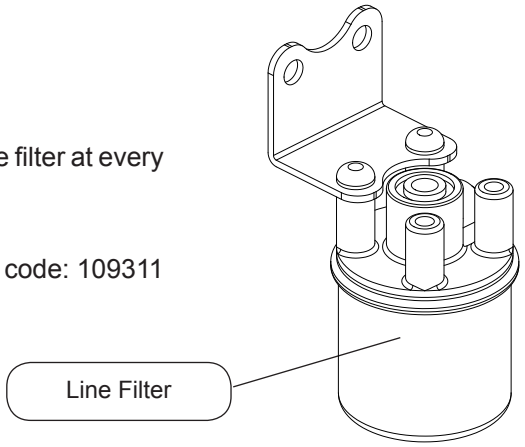


- **Flow Units (dosing devices)**
- It is recommended to change the flow units at every 12 months.
- See the flow unit codes in the part catalog.

• Line Filter

It is recommended to replace the line filter at every 12 months of operation.

Filter codes: ROMI R92135 / LUBE code: 109311



Never use oil of different type or manufacturer. This may cause chemical decomposition and form viscosity residue due to the different additives used by the suppliers. This viscosity residue may clog the outlets dosed to the lubrication points. Use always oil with the recommended viscosity and quality.

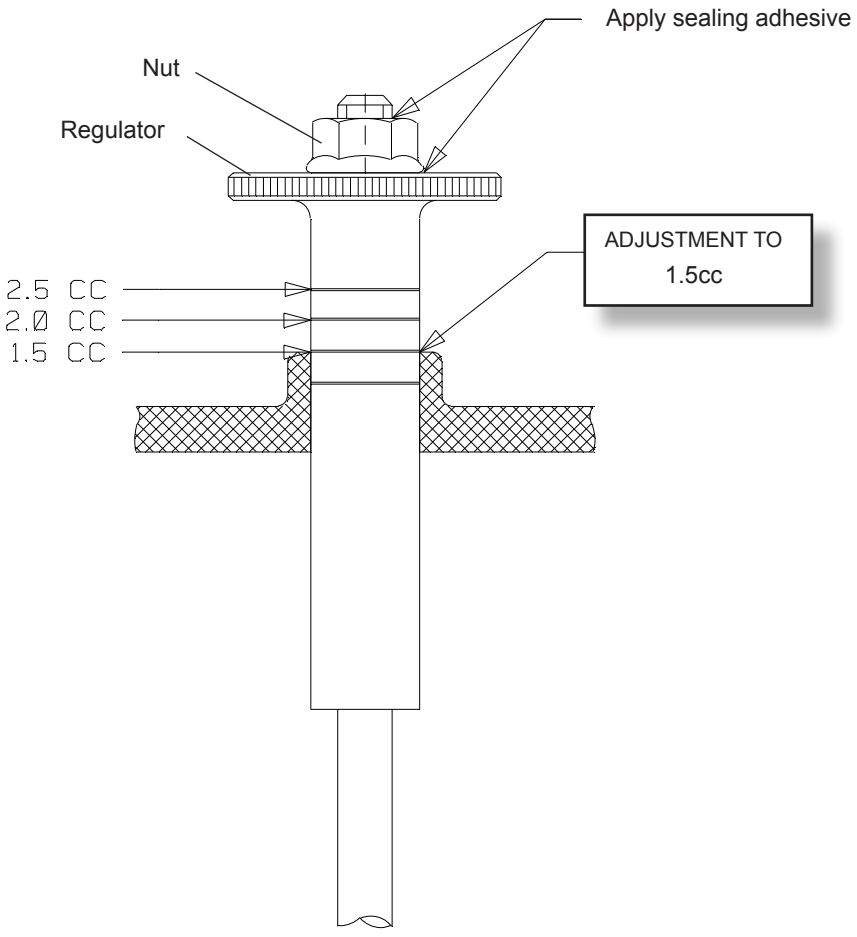
When a change of oil manufacturer or supplier occurs, replace completely the oil in the system, including the remaining oil in the pipes.

• Adjustment of oil discharge volume

To adjust the oil discharge volume, proceed as follows:

- Adjust lubrication pump through the regulator, turning it clockwise or counterclockwise.
- Seal with an adhesive glue the adjustment between nut and regulator and between nut and screw.
- Firmly tighten the nut against the regulator.

NOTE: Proceed with the adjustment only wen driving piston is completely free from motor action.



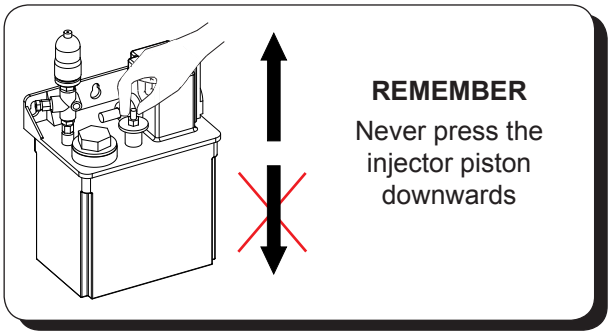
- **Oil change**

When the oil must be changed, proceed as follows:

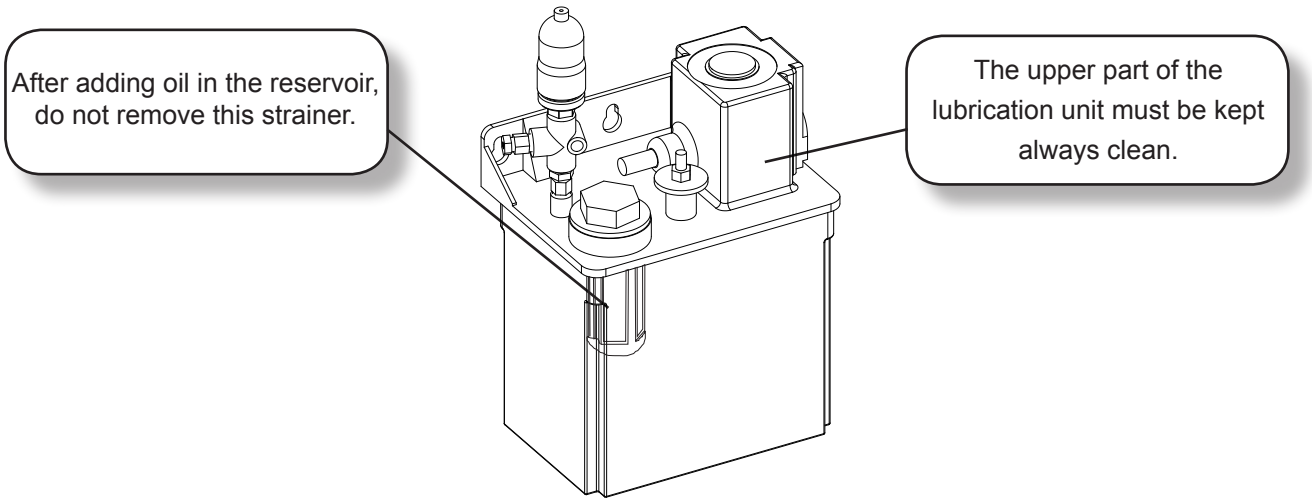
- To change oil in the beginning of a shift, drain the remaining oil in the reservoir, clean the reservoir properly, check aspiration filters and replenish the reservoir with clean oil.

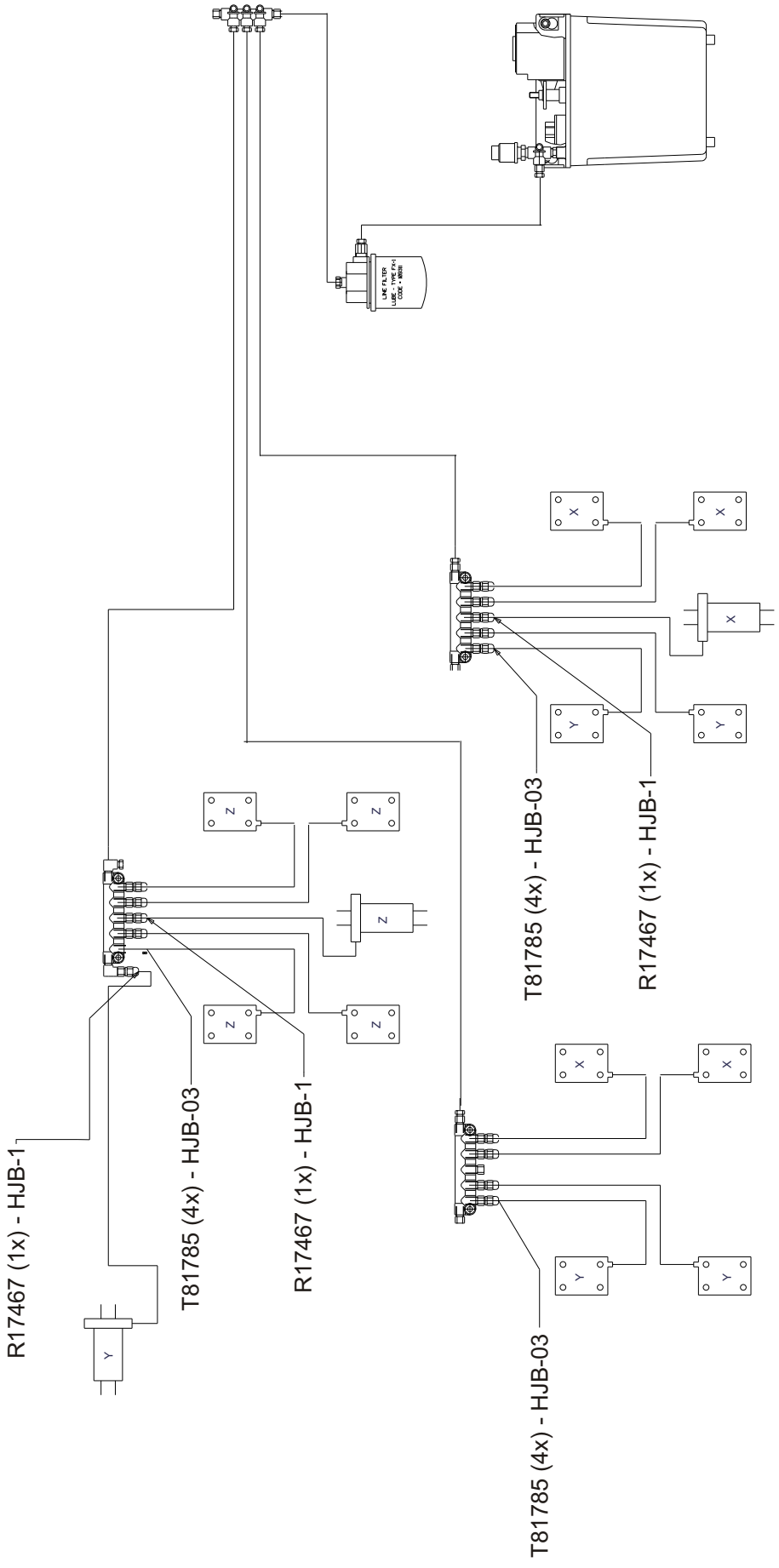
- When oil replacement occurs at end of a shift or out of normal working hours, in addition to the procedure above, drain completely the remaining oil in the piping, via forced lubrication, by activating the lubrication pump manually.

- For this operation, the injector piston located in the lubrication unit must be in its rest position to prevent the occurrence of a new pressurization at every 6 minutes and the machine shutdown.



Pull the injector piston manually, release it and wait for the end of pressurization. Repeat this procedure at least 20 times.

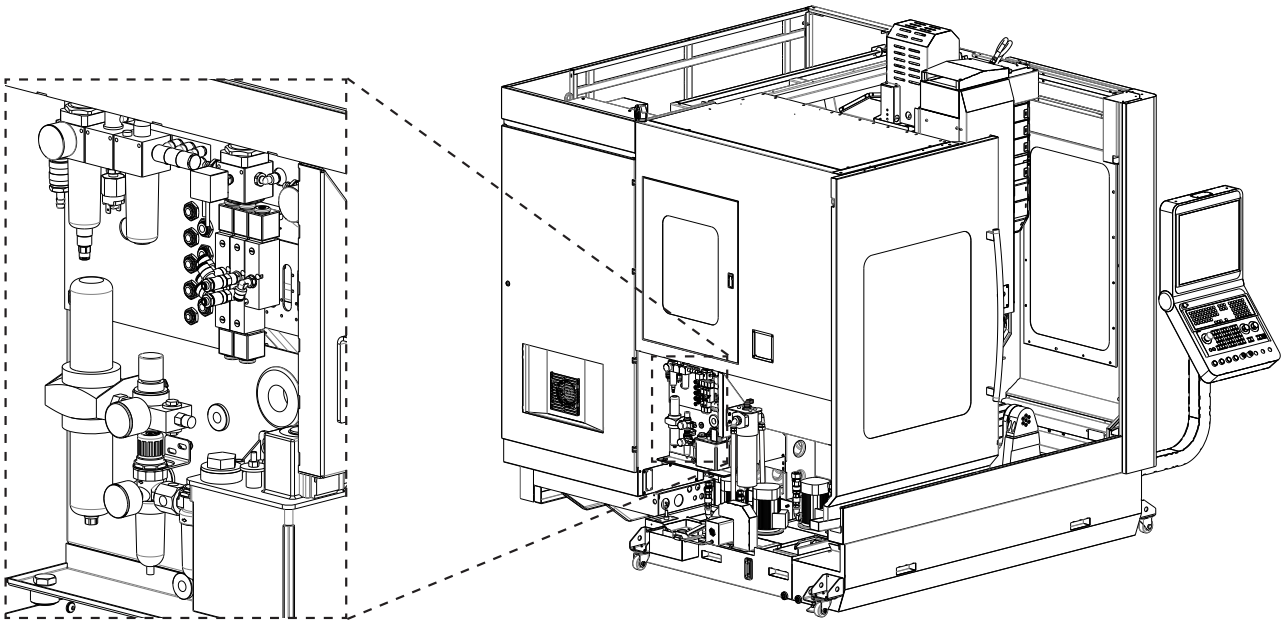

After adding oil in the reservoir, do not remove this strainer.
The upper part of the lubrication unit must be kept always clean.


R17467 (1x) - HJB-1
T81785 (4x) - HJB-03
R17467 (1x) - HJB-1
T81785 (4x) - HJB-03
T81785 (4x) - HJB-03
R17467 (1x) - HJB-1

3.3. PNEUMATIC SYSTEM

The pneumatic system is responsible for the following functions:

- Advance and retreat the tool changer cup;
- Open and close the tool changer door;
- Positive pressure from the table (axis B / C);
- Positive pressure of the headstock;
- Clean the headstock cone during the tool change;
- Pressurize the liner scale X, Y (accessory) and Z;
- Clean desktop during machining (accessory);
- Close the top area of machining (accessory);
- Clean the Renishaw tool (accessory).



3.3.1. Air quality and consumption Tablet

ATTENTION

For optimal operation of the pneumatic system all directions about the quality and air consumption must be satisfied

If the compressor does not provide the volume of air required for the system, there will be emergency stop the machine until the problem is solved

The compressed air line that feeds the pneumatic system must attend the following characteristics:

	Nominal Pressure (bar)	Air consumption (l/min)	
Advance and retreat the tool changer cup	6	4000	TOTAL
Open and close the tool changer door	6		
Positive pressure from the table (axis B / C)	0,6		
Positive pressure of the headstock	1		
Clean the headstock cone during the tool change	6		
Pressurize the liner scale X, Y (accessory) and Z	1		
Clean desktop during machining (accessory)	6		
Close the top area of machining (accessory)	6		
Clean the Renishaw tool (accessory)	6		

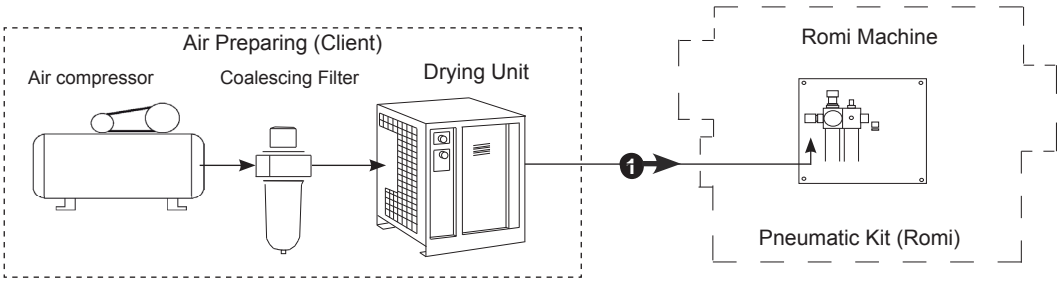
THE INTERNATIONAL STANDARD ISO 8573.1: 2001 ESTABLISHES STANDARDS FOR ASSESSING THE QUALITY OF COMPRESSED AIR. THIS STANDARD INDICATES A CLASSIFICATION SYSTEM FOR THE THREE MAIN CONTAMINANTS FOUND ON ANY COMPRESSED AIR SYSTEM: DUST, WATER AND OIL.

IMPORTANT

Damages caused to the components of the machine due to the contamined compressed air, high level of humidity, or high temperature, may generate loss of guarantee.

To avoid these damages, it is recommended the use of filters and driers to ensure the quality of the air supplied by the pneumatic network.

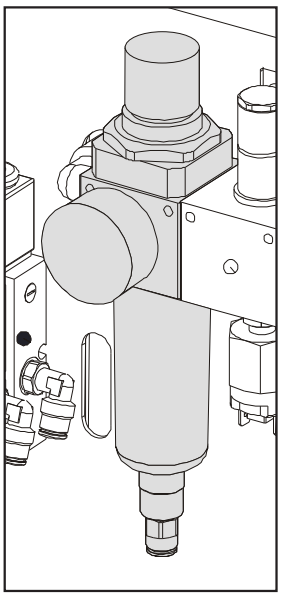
The correct dimensioning of the coalescing filters and of the drying unit will depend on conditions such as: compressor power and type, weather conditions, air humidity, etc. We recommend inquiries to a supplier or a specialist.



1 Compressed air supply according to the specifications described in this chapter (pressure/ quality volume/ temperature)

3.3.2. Maintenance Procedure

FILTER / REGULATOR FILTER



It is recommended that this product does not exceed the temperature of 50 °C and 10 bar. Always follow the catalog recommendations.

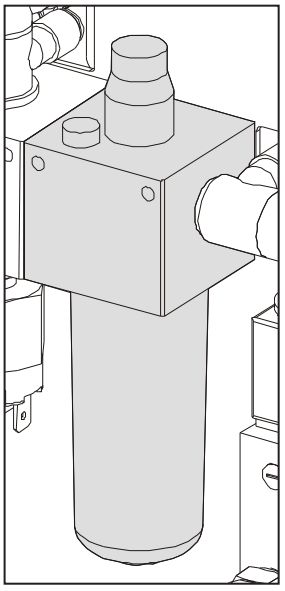
Drain filter capacitor on alternate days.

Check the condition of the set filter elements once a week, evaluate if whether is in good condition and if not make the exchange as follows:

- Press the cup that encloses the filter element to the up and after rotates it counterclockwise direction;
- Loosen the nut which holds the element and pull it out;
- Place the new filter element and thread the nut of support;
- Place the cup by pressing it up and after rotate it in a clockwise direction.

Obs: Is not recommended to wash the filter element, their exchange is suggested with a maximum of 12 months or 2000 hours of operation.

LUBRIFICATOR



It is recommended that this product does not exceed the temperature of 50 °C and 10 bar.

Check the oil level and fill if necessary. These measurements are typically made on a weekly basis, but this can vary depending on the lubricator working frequency.

The oil to be used must be ISO VG 32 model.

Is recommended to clean the lubricator every 6 months or 1000 hours of operation.
Perform the cleaning as follows:

- Press the filter lubricator cup up and after rotate it counterclockwise direction;
- Wash the cup and other components with mild soap and water, do not use chemical solvents;
- Mount the cup making sure that the sealing ring and the conductive plastic tube are not displaced or in poor condition.

3.4. COOLANT SYSTEM

The coolant system comprises reservoir, chip conveyor, motor pumps and complete piping.

The reservoir is equipped with casters so to remove it easily from the machine.

The cooling system promotes the coolant circulation latter having the function of cooling parts and tools while on machining operations, and also performs cleaning of cutting chips.

The tank should always be leaning along the machine base, because insides of the sheet metal are windows to the flow of coolant and chips. The fluid must pass through a filter which has the function of retaining chips and other impurities from the system.

The coolant reservoir has two filters. Clean them daily.

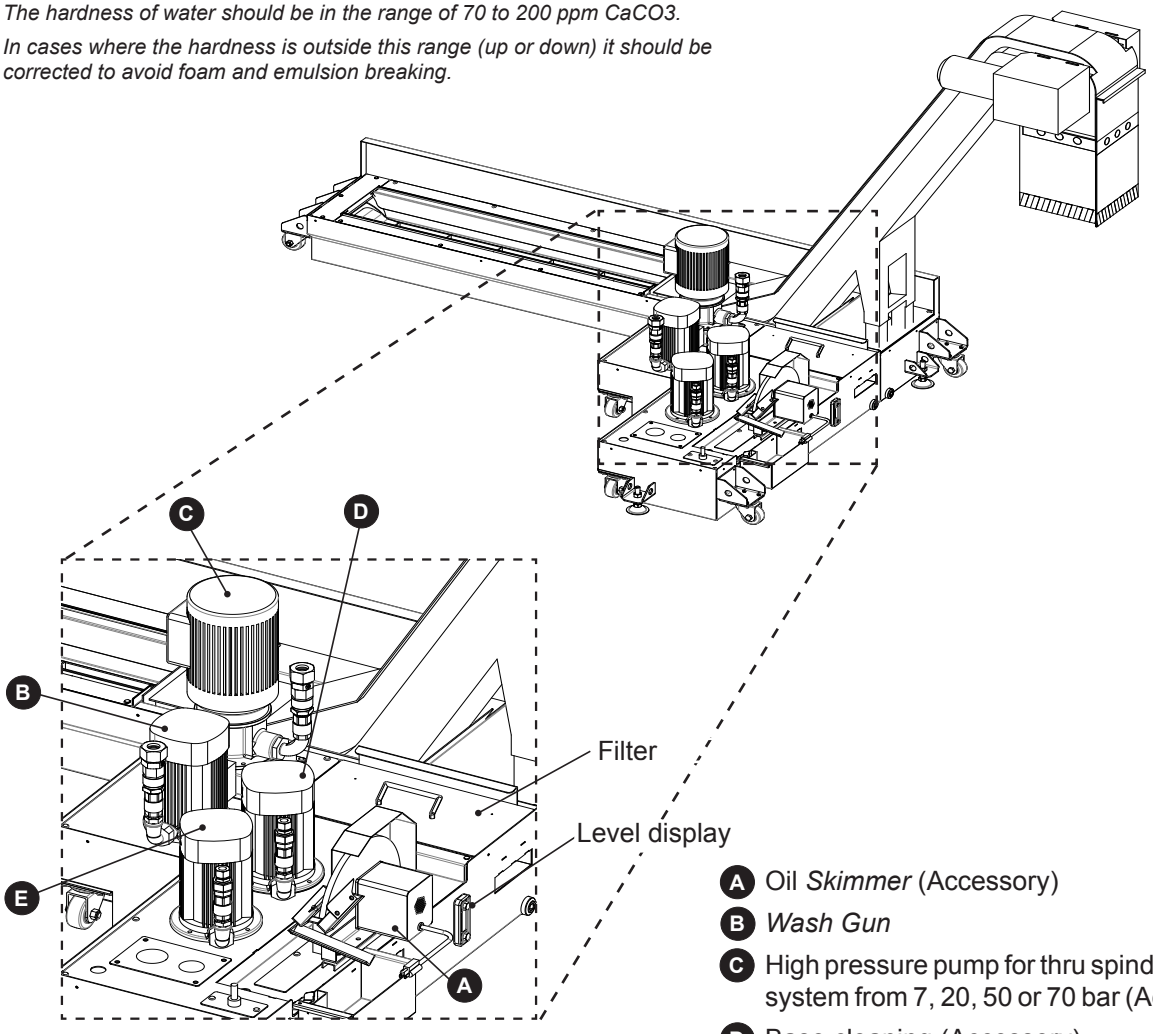
Coolant fluid quantity in the tank should be controlled thru oil level display. Capacities above informed represent the total tank capacity.

	OIL TYPE	Capacity Reservoir
COOLANT SYSTEM	(*)Soluble oil with 60% of mineral oil on it's composition	240 L

(*) Inert cutting fluid, with bistability characteristics, anti-foaming and compatibility with internal materials such as rubbers, acrylics, oils, greases and their various metals, preventing corrosion and changes in their materials.

The hardness of water should be in the range of 70 to 200 ppm CaCO3.

In cases where the hardness is outside this range (up or down) it should be corrected to avoid foam and emulsion breaking.



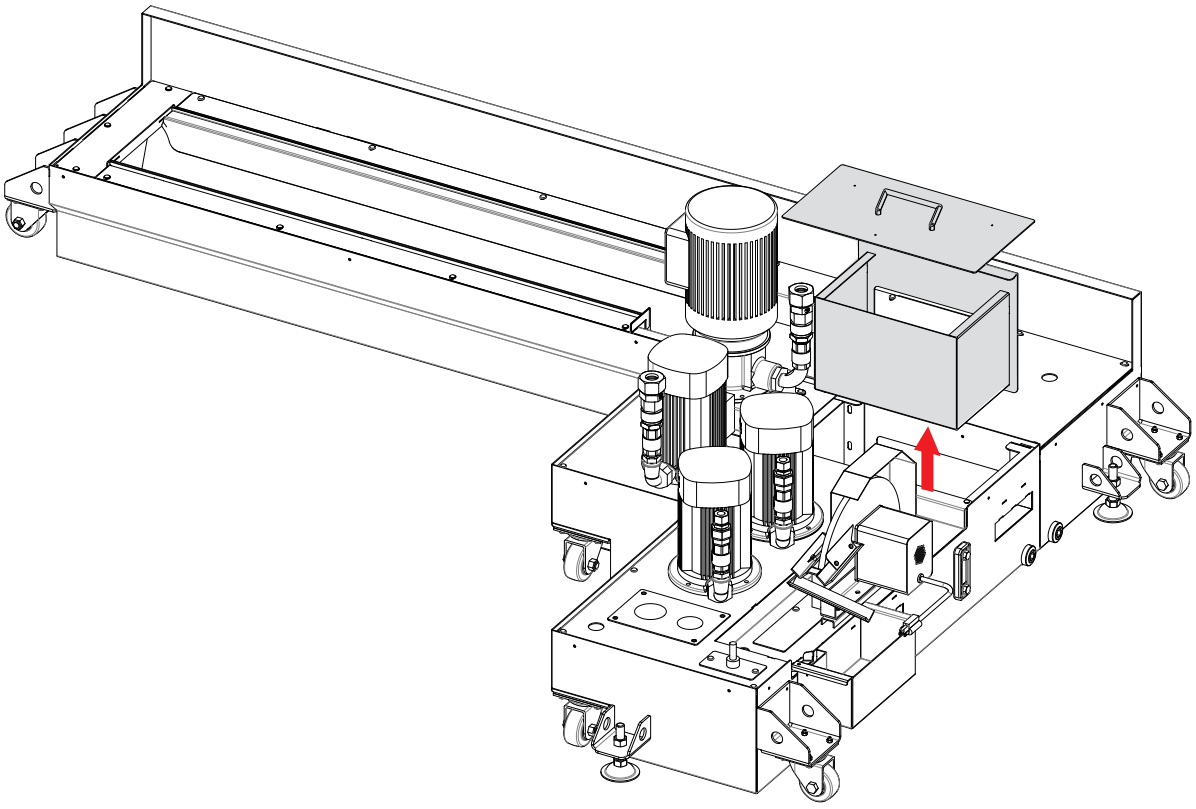
- **A** Oil *Skimmer* (Accessory)
- **B** *Wash Gun*
- **C** High pressure pump for thru spindle coolant system from 7, 20, 50 or 70 bar (Accessory)
- **D** Base cleaning (Accessory)
- **E** Cleaning protections

3.4.1. Preventive Maintenance

3.4.1.1. Chip conveyor filter cleaning procedure

Chip conveyor tank has a filter basket in which it retains particles larger than 1.5 mm diameter. This filtering is needed to protect and ensure the efficiency of pumps and machine cleaning system.

In order to perform this cleaning it is not necessary to turn off the machine, but all pumps and the chip conveyor must be turned off. After that it is necessary to wait the decreasing of cooling fluid agitation until its stabilization and then the basket must be removed (careful not to let any chips fall down in the tank and contaminate the clean area of the reservoir), the chips inside should be properly discarded and all the holes in the filter screen should be washed.



This cleaning should be daily performed. It is recommended to be performed at the beginning of the working shift because the cooling fluid is already stabilized.

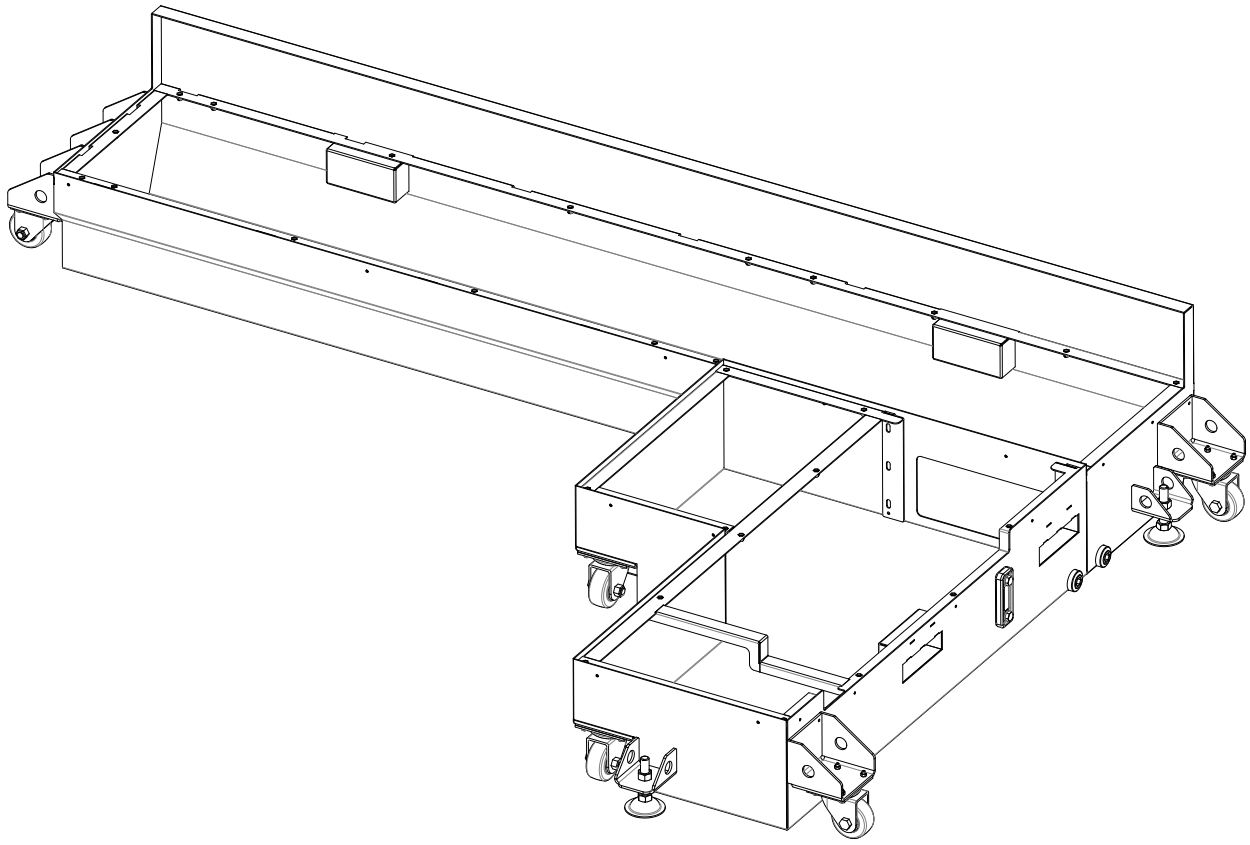
IMPORTANT:

Clean one filter by time, thus preventing chips from penetrating in the pump suction compartment.

3.4.1.2. Chip conveyor tank cleaning procedure

Before starting the procedure the machine must be switched off. Then all the cables and hoses that connect the chip conveyor tank to all other subsystems and the machine must be disconnected.

After that, chip conveyor tank should be moved around, outside the perimeter of the machine, to allow the removal of the chip conveyor, covers and pumps. When the procedure is finished the tank will be as shown below:



After completing tank disassembly it should be washed and all residues inside should be removed.

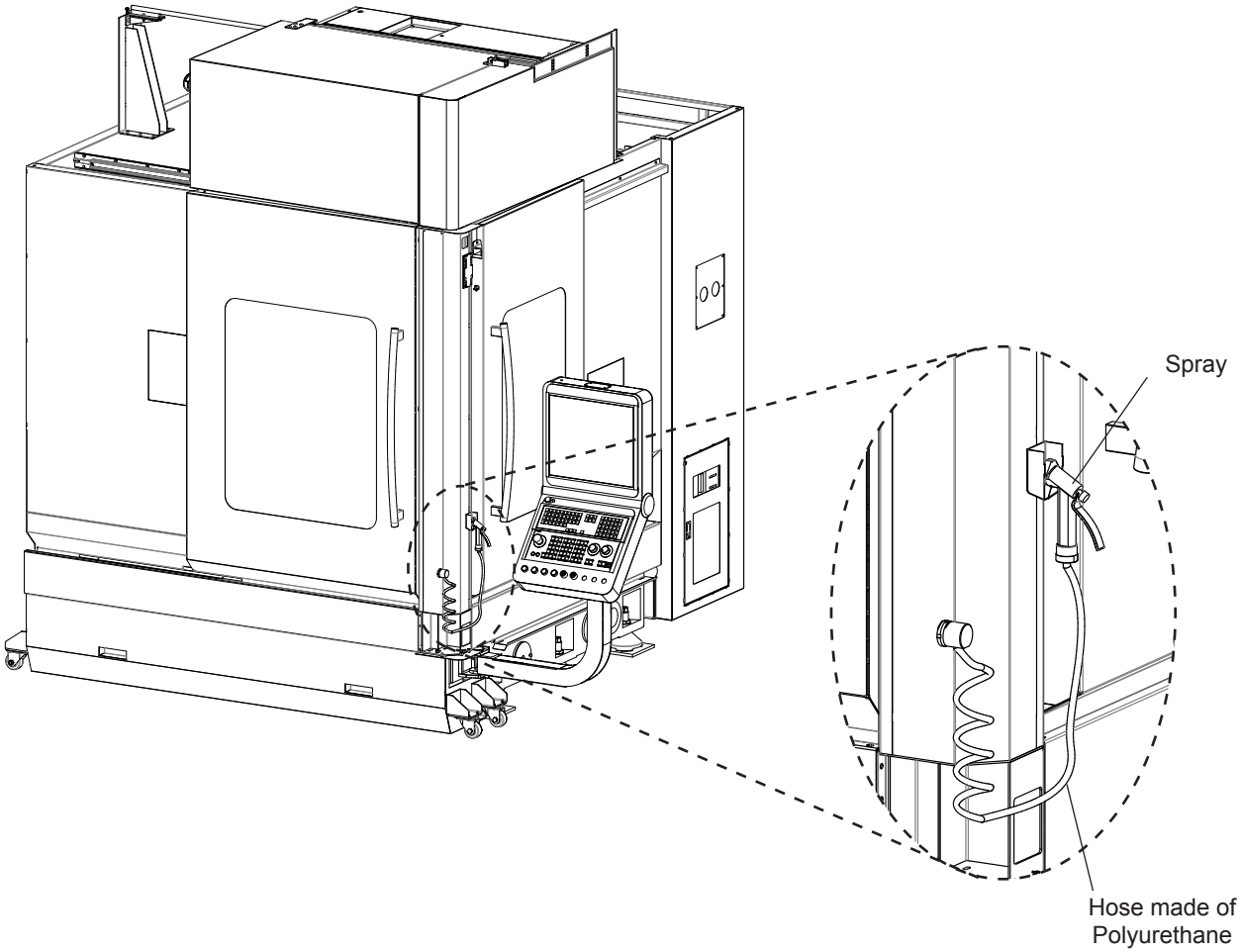
Considering a 44-hour/week working shift the chip conveyor tank cleaning should be performed every 6 months. When working shift is higher than reported the cleaning frequency should be proportionately reduced.

3.4.2. WASH GUN

This is a system aimed at helping chip removal and cleaning within the machine enclosure.

It is basically comprised by one hose and one spray. It is manually activated by the [wash Gun] button and releases coolant oil flow.

The spray hose made of polyurethane provides to the operator higher facility to handle the equipment (higher flexibility), and withstands twisting without occurring permanent deformation.



CAUTION

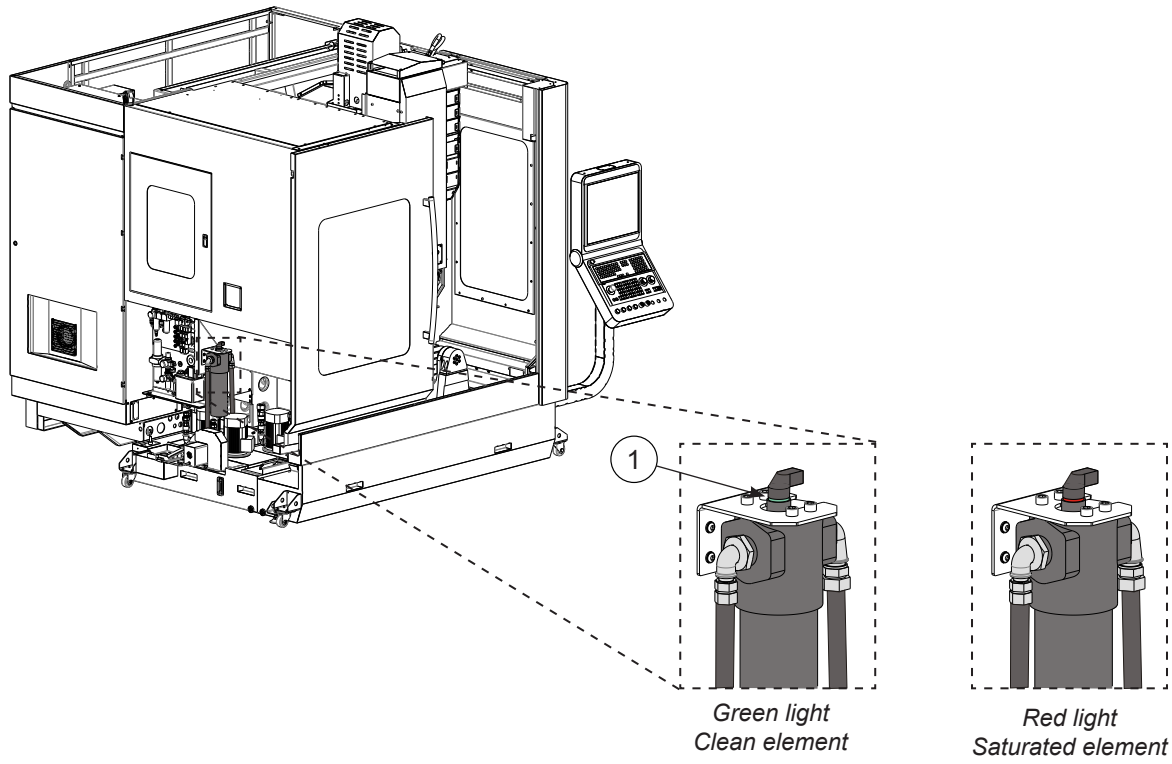
During operation in automatic mode, with cutting coolant, the nozzle also remains pressurized.

Therefore, should be avoided inappropriate activation of this equipment.

3.4.3. Pressure filter for High pressure pump for thru spindle coolant system (7bar)

The HDA filter is equipped with a "visual indicator exchange (1)" of the filter element which is actuated by the pressure due to the saturation of the element, thus indicating the necessity of exchange.

Follows illustration below showing the usual working condition and the condition for the filter element replacement.



Note: When the indicator is in red color the replacement of the filter element must be made immediately (ROMI number S23968).

It is not recommended cleaning the filter element due to low efficiency and the risk of damaging the element.

CAUTION

During cold starts may occurs clogging indicator driving due to the increased viscosity of the refrigerant.

Wait until the fluid is within the normal working temperature. If the filter element is not contaminated the contamination indicator will restart automatically, otherwise the filter element must be replaced.

3.4.4. OIL / COOLANT SEPARATOR (OIL SKIMMER)

Skimmer has the purpose of separating lubricant oil from coolant inside the coolant reservoir. It is located on the coolant reservoir and is turned on as soon as the machine is turned on.

The equipment cleaning and maintenance assure good functioning and extended lifetime.

Prevent the utilization of solvents that contain dichloroethane, methylene chloride or acetone for cleaning.

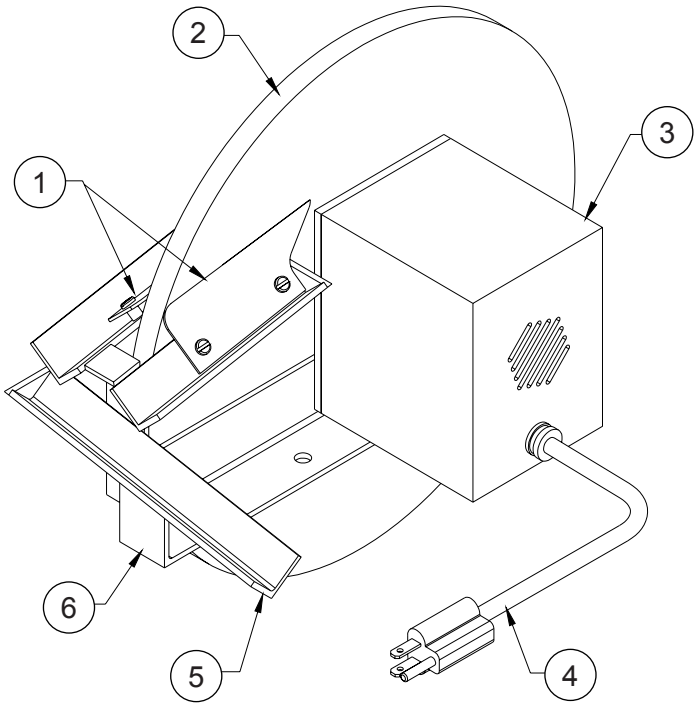
Keep work area clean and organized to prevent accidents.

ATTENTION

Make sure the Skimmer is turned off when performing any intervention.

Parts Identification:

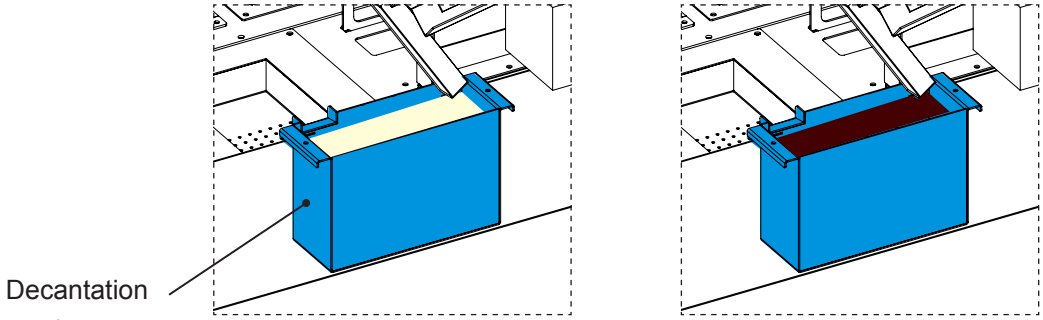
- Wiper (1)
- Disk (2)
- Motor box (3)
- Instalation - 110V (4)
- Discharge (5)
- Support (6)



The oil skimmer/ coolant has a separation box which, when filled (three separations) by oil shall be cleaned.

It is recommended to inspect it every day.

Following figures exemplifying the normal operation condition and cleaning condition.



Normal work Condition

Cleaning Condition

IMPORTANT:

Oil shall not be discarded at rain water net, but according local regulation in force.

The volume of separation box/ discard is 1 gallon (3.78 liter).

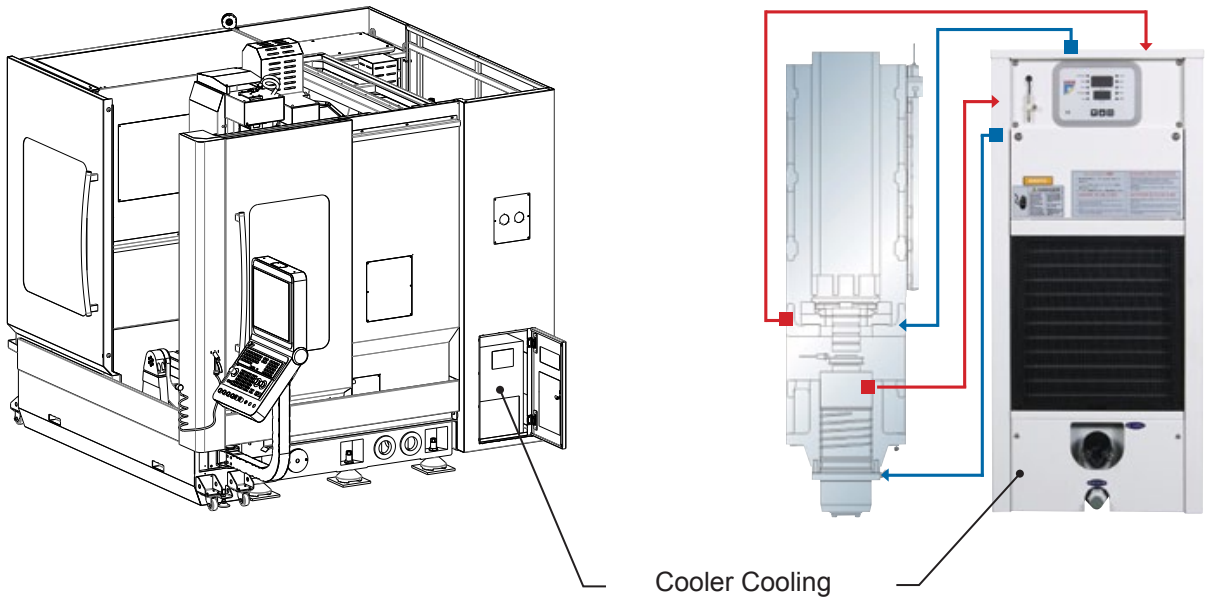
3.4.5. Cooler Cooling

The spindle cartridge and the flange of fixing motor, are cooled by a fluid recirculation system, specific for the headstock, ensuring thermal and geometric stability to the set.

The headstock housing has a camera which surrounds the cartridge housing for cooling liquid circulation.

The cooling system is composed to a cooling unit (air-fluid heat exchanger), which promotes coolant flow in the headstock casing removing the heat generated by the spindle rolling bearings.

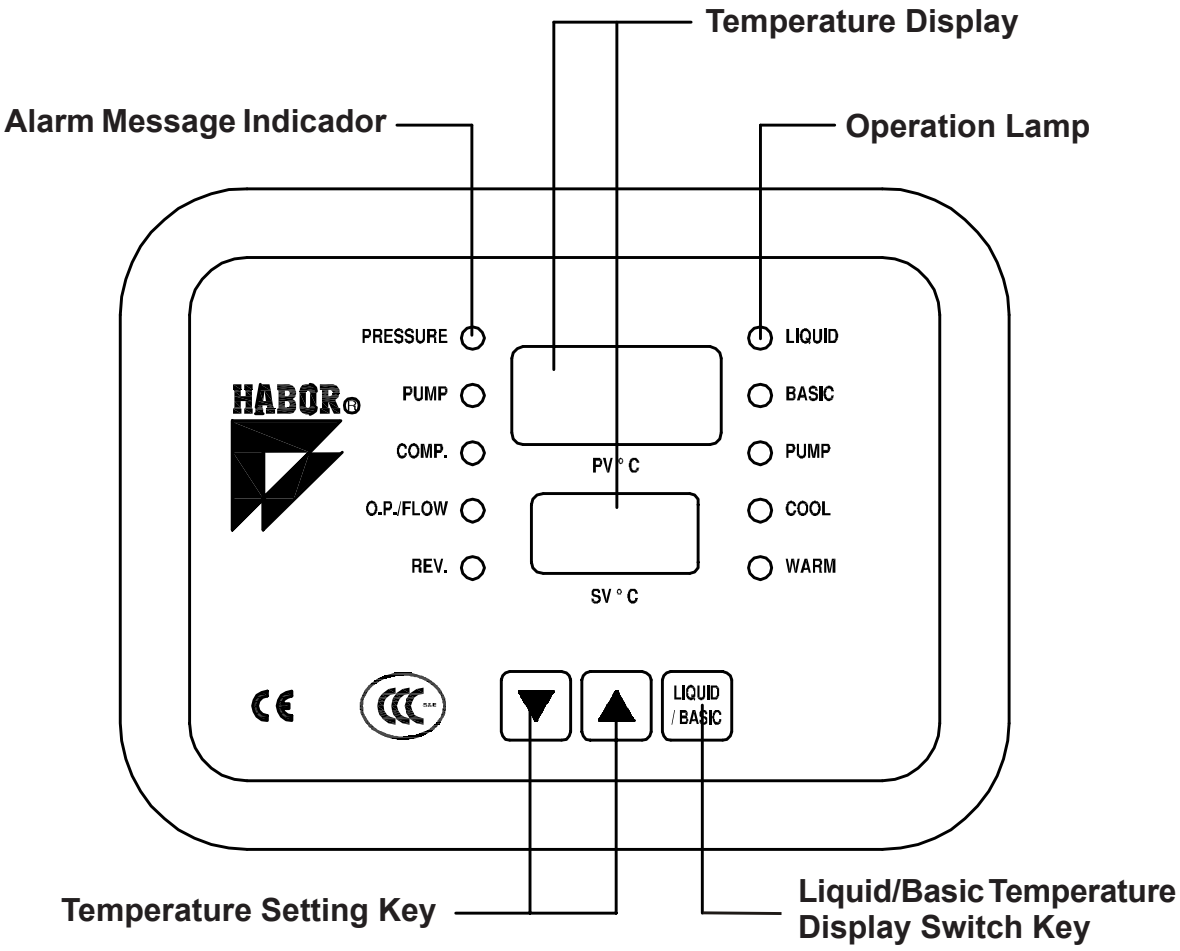
The system performs the reduction of variation in temperature between the headstock and environment, where the temperature of the headstock remains very close to the environment temperature. Brings as great benefit the minimization of possible thermal distortions of the housing, ensuring the perfect alignment of the spindle track center in the machining operations that requires high positioning accuracy from the shaft Z.



3.4.5.1. General Safety Precaution

- Keep the work area clean, lighted in a dry and organized ambient;
- Avoid cooler light exposure or inflammable materials;
- Keep away from the children;
- Apply appropriate power cable;
- Avoid handling using: large clothes, rings, bracelets, necklaces or any other accessory that can become entangled in moving parts. In the same way is mandatory using anti-slip footwear and hair protection near to the cooler;
- Do not put anything on the cooler as this can causes damage when these items fall on the cooler;
- Disconnect completely the cooler from any power supply in case of need to perform any electrical repair.

3.4.5.2. Operation



Panel explanation :

Temperature Display

PV'C : Displays the current oil temperature or the current ambientJmachine body temperature.

SVºC: Displays the current temperature set value.

Operation Lamp

PUMP: I indicates if the pump starts operating.

COOL: Indicates il cooling process starts.

Temperature Setting Button

Set temperature by ▼▲ keys. Please hold the key for more than 0.5 seconds to change the value.

Liquid/Basic Temperature Display Switch:

Display changes to ambient or machine.

Alarm Message Indicator

Should any error occur during operation; the cooler unit will stop and display error messages.

3.4.5.3. Maintenance

Please lake note on the salety precaulion before proceed. For the cooler until performing at its best cooling capacity and to extend its life-time, regular mainlenance is required. After in order to keep the cooler in the best condilton, it requires a well-ventilaled and unobstructed room.

Constantly check the quality of the coolant and replace the fluid according to the maintenance plan as described in the machine manual or whenever necessary. The quality of the fluid directly affects the quality or cooling and can still causes damage to the pump.

3.4.5.4. Cleaning

Please swilch off lhe main power before proceeding any maintenance or cleaning (includes removing the air filters). Removing any componenls during operalion may causes serious injure to personnel or even damage lhe cooler.

Find the components that requires cleaning regularly:

- **Cooler Body;**
- **Condenser;**
- **Air Filter.**

Cooler Body Cleaning:

- Clean lhe surface wilh neutral delergent. Do not use hot water, sleel-brush, polishing powder or any acidic solvents;
- Clean cooler body: when cleaning lhe internal cooler area, please avoid water;
- Please use dry materials for cleaning any eleclrical components.

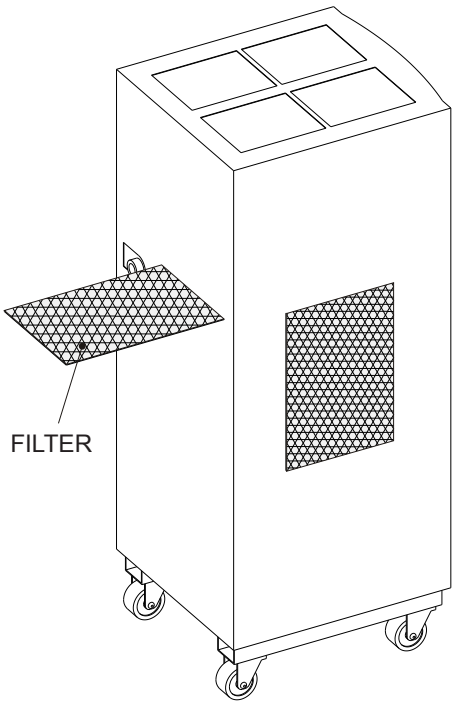
Condenser cleaning:

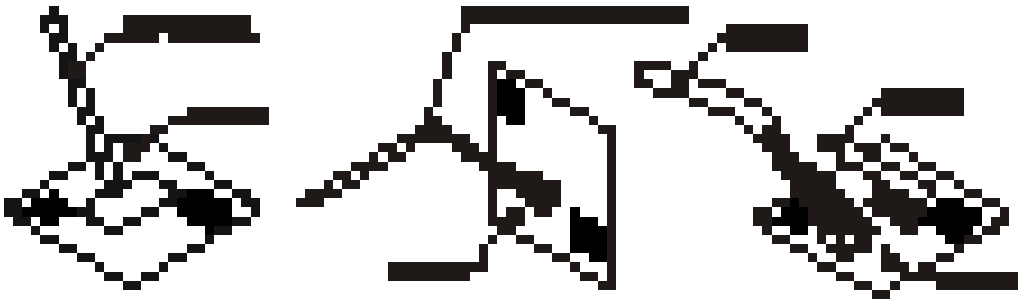
Please check if the condenser is clogged wilh contaminanls. Use Compressed air or long brush to remove the dust lrom the condenser.

Air filter cleaning:

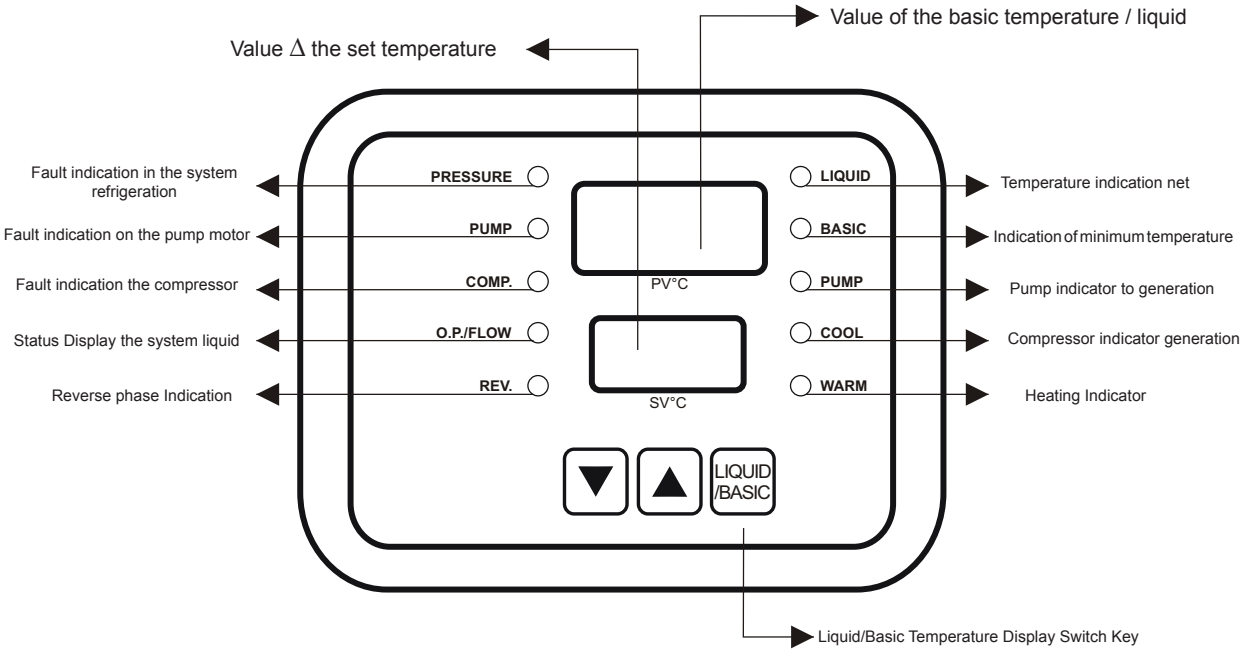
- Remove the filter as illustrated in figure:

Use a vacuum cleaner, compressed air, water and brush for cleaning the filter. Let the filter dry after the leaning before install it again in the cooler. Clean the filter regularly at least once every 15 days and filter cleaning is recommended whenever it is in a dark color.





3.4.5.5. Defective Table Causes and Solutions



(A)	Explanation	Liquid temperature sensor fault.
Sn PV°C OL SV°C	Possible Cause	* Broken connection of the liquid temperature sensor. * Liquid temperature sensor fault. * Temperature controller failure.
	Inspection	* Check if the connection of the liquid temperature sensor is broken * If the connection is not broken, then there are chances of temperature controller failure or sensor failure.
	Solution	* Reconnect the wire connection, or replace the wire if necessary. * Replace the failure parts.
(B)	Explanation	There is a problem with the ambient or machine body temperature sensor.
Sn PV°C r0 SV°C	Possible Cause	* The wire connection of the ambient or machine body temperature sensor is broken. * The ambient or machine body temperature sensor failure. * The temperature controller failure.
	Inspection	* Check if the wire for ambient or machine body temperature sensor still connected. * If there are no problems with the connection, chances are either the sensor or the temperature controller is faulty.
	Solution	* Reconnect the wire connection, or replace the wire if necessary. * Replace the failure parts.

(C)	Explanation	Liquid temperature is too high for the cooler to process.
AH PV°C OL SV°C	Possible Cause	* Process load over the limit of the cooler unit's capacity. * Liquid temperature sensor failure. * Refrigeration system failure.
	Inspection	* Check if the ambient and liquid temperatures are higher than the limit. * Check if the cooler unit is capable for the process load. * The copper pipe near the low pressure side of the compressor is not cold. * Fins of condenser are not hot. * The temperature of the dryer is lower than exhaust heat * Check if the sensor functions properly.
	Solution	* Keep the liquid temperature below 45°C. * Change cooler unit to a larger cooling capacity. * Replace the liquid temperature sensor. * Contact the refrigeration technician for refrigeration system failures.
(D)	Explanation	Liquid/Ambient temperature is too low the cooler to process.
AL PV°C OL SV°C	Possible Cause	* Liquid temperature is too low. * Ambient temperature is too low. * Temperature controller failure. * Liquid/Ambient temperature sensor fault.
	Inspection	* Check if the liquid temperature and the ambient temperature are above 5°C. * Check if the temperature sensor functions properly. * If the above seems to be order, then the temperature controller failed.
	Solution	* The cooler unit and the machine tools should start simultaneously. * Keep the ambient above 5°C. * Replace faulty parts.
(E)	Explanation	Surface temperature of the compressor is too high.
PV°C EF SV°C	Possible Cause	* Poor heat dissipation. * Incorrect power voltage input. * Faulty compressor.
	Inspection	* Check if any air vent is cloggy. * Check the input power if it's correct voltage and phase. * Check the starting condition of the compressor, measure the starting voltage.
	Solution	* Create better heat dissipation environment. * Reconnect the wires for correct power input. * Replace faulty compressor.

(F)	Explanation	Liquid level in the tank is too low.
PV°C EC SV°C	Possible Cause	* Not enough liquid in the liquid tank. * Liquid level switch fault.
	Inspection	* Check if the liquid level in the tank is sufficient. * If the liquid within the tank is enough, chances are liquic level switch fails.
	Solution	* Make sure the liquid within the liquid circulating system is sufficient. * Replace the faulty liquid level switch.
(G)	Explanation	There is a pressure fault within the refrigeration system.
	Possible Cause	* Low or over charge of refrigerant. * Obstruction/leakage occurred in the refrigeration system. * Condenser/air filter are dirty or cloggy. * Poor heat dissipation. * Fan failure.
In PV°C - - SV°C	Inspection	* The copper pipe near the low pressure side of the compressor is not cold. * Fins of condenser are not hot. * The temperature of the dryer is lower than exhaust heat. * Check if cooler unit's internal temperature is too high. * Check if the air intake or exhaust is cloggy. * Check if the air filter or the condenser is dirty. * Check if Fan out of order.
PRESSURE	Solution	* Please contact the refrigeration service technician for faults within the refrigeration system. * Clean the air filter and the condenser regularly to improve the heat dissipation, and remove any obstructers from air intake or exhaust. * Replace faulty parts.
(H)	Explanation	There is a fault within the pump which trip out the overload protector.
	Possible Cause	* Trip-out in overload protector. * Poor insulating or a burn out pump. * Obstruction in the liquid pipe.
In PV°C - - SV°C	Inspection	* Check if the pump motor still operates. * Check if the bearing is cloggy. * Check if the overload protector has trip-out. * Check the liquid pipe if the liquid flow is smooth.
PUMP	Solution	* Replace faulty pump. * Reset the overload protector. * Clean the liquid circulating system, add a filter if necessary.

(I)	Explanation	There is a fault within the compressor which trip out the overload protector.
	Possible Cause	* Incorrect power voltage input. * Compressor has burned out. * Overload protector trip out. * Poor heat dissipation. * Fan failure.
	Inspection	* Check if the input power voltage is correct. * Check if the compressor has burned out. * Check if the overload protector has trip out. * Check if cooler unit's internal temperature is too high. * Fan out of order.
	Solution	* Input the correct power voltage. * Replace burned out compressor. * Reset the overload protector. * Improve the working environment to lower ambient temperature and create better ventilation. * Replace fan.
(J)	Explanation	There is a liquid pressure fault or insufficient liquid amount within the liquid circulating system.
	Possible Cause	* No liquid flow or insufficient liquid. * Liquid pressure loss. * Flow rate switch failure. * Air penetrated into liquid circulating system. * Pump motor failure.
	Inspection	* Check if there's enough liquid within the liquid circulating system. * Long, thin and flattened liquid hoses will cause liquid pressure loss. * Flow rate switch fault due to low flow rate. * Check if there's any air penetrated into the liquid circulating system. * If all the check above is alright, there's a chance of failure in the flow rate switch.
	Solution	* Supply more liquid into the tank or the circulation system to the rated level. * Increase the diameter of the hose or shorten the length of hose to avoid liquid pressure loss. * Replace faulty pump motor. * For air penetrated into the liquid circulating system, please refer to **3-1 Checklist before operating.** * Replace faulty parts.

(K)	Explanation	The power phase input has been reversed.
In PV°C - - SV°C REV	Possible Cause	* Reversed phase of main power source. * Power source is single- phased. * Reverse-phase relay failure. * Temperature controller failure.
	Inspection	* Check if the power phase input is correct. * If the power phase is correct, it's whether the reverse-phase relay or the temperature controller has failed.
	Solution	* Reconnect the power cable with correct phase. * Three phase cooling unit should be connected to three phase power source. * Replace the faulty parts.

3.4.6. Supply Systems

	1	2	3	4	5	6	7	8
	Lubrication Automatic System	Coolant System	Pneumatic System Lubrication	Hydraulic System	Refrigeration Cooler	Rotary Table (B/C Axis)	Automatic Tool Change	Guide the Door Operator
Oil Type	*DIN 51502 CGLP 68*	*Minimum Composition 60% Mineral Oil*	*DIN 51502 HLP 32*	*DIN 51502 HLP 46*	*ADDITIVE DIVINOL THERMOSURE (S42756)*	*DIN 51502 HLP 150*	*DIN 51502 CLP 220~280*	*DIN 51502 CLP 680*
System Adjustment	*1,5 cc / discharge*	*--------*	*1 Drop / 5 Cycles*	*--------*	*--------*	*--------*	*--------*	*--------*
Supply / Replace Frequency	*Level Sight*	*Level Sight*	*Level Sight*	*Level Sight*	*12 Months*	*6 Months*	*12 Months*	*6 Months*
Cleaning Reservoir	*12 Months*	*Bimonthly*	*6 Months*	*6 Months*	*Monthly*	*--------*	*--------*	*--------*
Cleaning Wire Fabric Filters	*--------*	*Daily*	*--------*	*--------*	*--------*	*--------*	*--------*	*--------*
Replace or Cleaning Suction Filter	*12 Months*	*--------*	*--------*	*Monthly*	*--------*	*--------*	*--------*	*--------*
Replace Line Filter	*12 Months*	*--------*	*--------*	*Warning Indicator*	*--------*	*--------*	*--------*	*--------*
Flow Unit Inspection	*12 Months*	*------*	*------*	*------*	*------*	*------*	*------*	*------*
Reservoir Volume	*1,8 L*	*240 L (Solution of 3 to 5%)*	*37 mL*	*30 L*	*7 L*	*5 L*	*7,8 L*	*9 mL*
High Pressure System Capacity 20, 50 and 70 bar	*------*	*210L (Solution of 3 to 5%)*	*------*	*------*	*------*	*------*	*------*	*------*

NOTE: The estimated time in the Hydraulic Plan is considering a working regime of 44 hours per week.

CHAPTER 4

ACCESSORY MAINTENANCE

4.1. CHIP CONVEYOR

Chips and collant flowing from the machine's work area are collected by the chip conveyor, by its capture area.

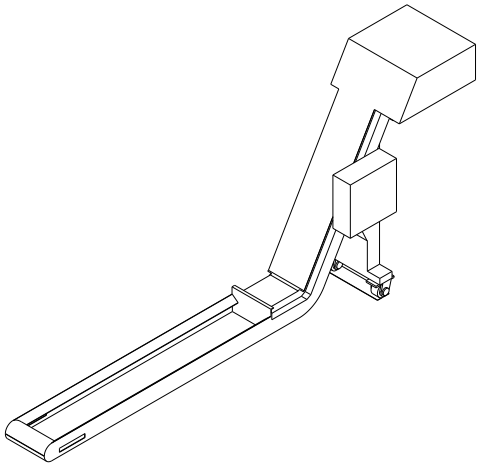
Virtually all the chips are separated from coolant at the chip conveyor, and carried to the conveyor's exit, to be collected on a bucket.

By its turn, the coolant passes from the chip conveyor to the tank via side opening.

Below this opening there is a basket installed, manufactured in perforated plate, to collect eventual chips passing by the chip conveyor.

The motor-reducer used provides permanent lubrication, and does not require any lubrication.

Regarding electrical motor: pay attention on eventual abnormal noise and/or vibrations.



ATTENTION:

- Motor heating up to 80ºC is considered normal.
- Check tension on the articulated belt or drag chain in the first turns after one-week operation, and repeat at every 45 days.

Lubricate the conveyor belt with lithium-based M.P. (Multipurpose) oil or grease, examples:

GW 13	Grease M.P. - 2
SHELL	Refinac WB
TEXACO	Marfac MP - 2
ESSO	Mult H

Lubrication must be made approximately at every 1,500 hours (reduce this frequency for heavier works) of operation, by previously disassembling the removable guards, or in the indicated points.

Check frequently whether the belt exhibits damaged parts, and when required, replace them immediately, thus preventing damages that would cause degradation of the assembly as a whole.

When the conditions above are properly met, the chip conveyor will provide extended durability, and consequently lower wear.

ATTENTION!

For more information on the chip conveyor, refer to the manual supplied with the accessory.

4.2. COOLING AND CHIP CONVEYOR CONNECTORS

Do not engage or disengage Cooling and/or Chip Conveyor connectors while the Master Switch is in ON position. Pay attention when inserting or extracting connectors. Make sure they are not wet when handling them. Risk of electrical shock.

When any device is removed or not installed, make sure that the connector caps are installed on their place.

The main voltage present in these connectors is 380VAC. The command signal used in the Chip Conveyor connector is 24VDC.

Never connect any other device, but the Cooling Pump and Chip Conveyor specified for this machine; otherwise, there is risk of serious damages to the machine/device and operator injuries.

Keep the area around these connectors always clean and free of any obstruction.

4.3. AIR CONDITIONING FOR ELECTRICAL PANEL

Illustrative Figure

The air conditioning for the electrical panel was developed and manufactured to dissipate heat or cool the internal air in the panel, by keeping it at a maximum temperature of 40ºC, thus protecting the elements sensitive to temperature variation.

Air conditioning is indicated for environment temperature from +40ºC to +55ºC.

Frequent cleaning:

Must be made by using compressed air.

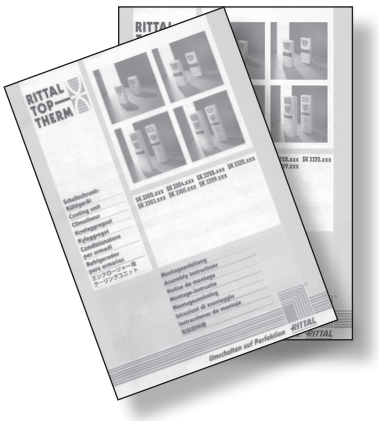
Filtering belt:

The utilization of filtering belt is only required when the environment air is vey impure for the work, thus preventing the condenser from clogging.

To check the filtering belt change procedure, refer to the manual supplied with the accessory.

ATTENTION!

Before performing any maintenance work,
turn air conditioning off.

ATTENTION!

For more information on the air conditioning, refer to the manual supplied with the accessory.